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ABSTRACT

Alcohol expectancies have been found to predict later onset of drinking among adolescents. This study examined whether the relationship between level of alcohol use and expectancies is paralleled with cigarette smoking, and attempted to identify the content of smoking expectancies. An instrument to measure the subjective expected utility of smoking was developed by administering an 80-item questionnaire to 382 undergraduate smokers and exsmokers. A principal components analysis yielded four interpretable factors: negative consequences, positive reinforcement, negative reinforcement, and appetite/weight control. Fifty items with high loadings on these factors were retained to create the four scales of the Smoking Consequences Questionnaire. Coefficient alpha reliabilities, calculated from a separate subject sample, averaged .94. As predicted, the scales were able to differentiate between daily smokers and less frequent smokers. Heavier smokers had more positive expectancies about the effects of smoking, and less negative expectancies. Females had more positive expectancies than males on the appetite/weight control scale. Female exsmokers reported much more positive expectancies than male exsmokers on the negative reinforcement scale, suggesting a possible risk factor for females who quit smoking. (Author/NB)

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SMOKING OUTCOME EXPECTANCIES AMONG COLLEGE STUDENTS

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Abstract

Outcome expectancies have assumed an important role in recent theories of drug use and relapse. To date, most of the research on drug expectancies has taken the form of comparing groups that differ in their degree of alcohol use. In general, greater consumption levels are associated with more positive expectancies about the effects of drinking. Alcohol expectancies also have been found to predict later onset of drinking among adolescents. One goal of the present study was to examine whether the relationship between level of alcohol use and expectancies is paralleled with cigarette smoking, and to identify the content of smoking expectancies. The college years often represent a period during which occasional cigarette use either tapers off or instead develops into a full addiction. Because smoking expectancies may moderate this progression, measurement of expectancies may permit identification of students at risk for greater smoking. Thus, another goal of this study was the development of an instrument to assess smoking expectancies in college students.

An instrument to measure the subjective expected utility of smoking was developed by administering an 80-item questionnaire to 382 undergraduate smokers and exsmokers. A principal components analysis yielded four interpretable factors: negative consequences, positive reinforcement, negative reinforcement, and appetite/weight control. Fifty items with high loadings on these factors were retained to create the four scales of the Smoking Consequences Questionnaire. Coefficient alpha reliabilities, calculated from a separate subject sample, averaged .94.

As predicted, the scales were able to differentiate between daily smokers and less frequent smokers. Heavier smokers had more positive expectancies about the effects of smoking, and less negative expectancies. Females had more positive expectancies than males on the appetite/weight control scale. Female exsmokers reported much more positive expectancies than male exsmokers on the negative reinforcement scale (i.e., relief from negative affect), suggesting a possible risk factor for females who quit smoking.

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In recent years, theories and research on addiction motivation have included a prominent role for cognitive processes. In particular, outcome expectancies for drug and alcohol use have received much attention. Models of substance abuse have incorporated outcome expectancies into the causal chain leading to drug use and relapse (e.g., Cooper et al., 1988; Cox & Klinger, 1988; Marlatt, 1985; Niaura et al., 1988), although models differ in their placement of expectancies along that causal chain.

The relationship between outcome expectancies and substance abuse has been demonstrated in a number of studies showing that positive expectancies are associated with higher levels of drug use. The bulk of this work involved alcohol consumption. A questionnaire for assessing alcohol expectancies (the Alcohol Expectancy Questionnaire--AEQ) revealed six expectancy factors: global positive expectations; social and physical pleasure; sexual enhancement; power and aggression; social assertiveness; and tension reduction (Brown et al., 1980). Several studies found a positive relationship in adults between alcohol consumption and expectancy scores on these scales. Brown (1985) also found that AEQ scores, especially tension-reduction, were negatively related to successful outcome at one year following alcoholism treatment. Other expectancy questionnaires have also shown a positive correlation with alcohol use among adults and adolescents.

There is comparatively little research on outcome expectancies for smoking. The most relevant studies have all used junior or senior high school students (e.g., Bauman and Chenoweth, 1984).

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Study Goals

The goals of the present study were: (1) to develop a questionnaire for measuring the subjective expected utility of smoking in college students; (2) to discover through factor analytic procedures the primary smoking expectancy dimensions; and (3) to begin validation of the questionnaire by comparing expectancy scores across smoking status categories, in the manner of prior alcohol expectancy research.

Most studies of drinking or smoking expectancies have assessed only subjects' probability ratings of possible outcomes. A minority of studies have also assessed subjects' evaluation of the possible outcomes of drinking or smoking, and have combined the two ratings to form measures of subjective expected utility (SEU; e.g., Bauman & Chenoweth, 1984; Critchlow, 1987; Mausner, 1973). SEU scores are derived by weighting probability ratings by the desirability of the outcome. In this manner, expectancies for outcomes that are important for the subject get weighted more than unimportant outcomes, and expectancies for undesirable outcomes get negative weights. Thus, SEU captures both the cognitive and motivational components of expectancy (Marlatt, 1985). In contrast to simple probability ratings, SEU scores should be more sensitive to individual differences in outcome desirability (e.g., tension-reduction may be a more desirable outcome for some smokers than for others) as well as temporal or situational changes in outcome desirability (e.g., tension-reduction may become a more desirable outcome when a smoker is under pressure at work). In sum, we believe that a measure of the SEU of smoking will better reflect smoking motivation than would probability ratings alone. It, therefore, should be more predictive of to treatment outcome, as well as laboratory measures of smoking motivation.

By submitting the questionnaire items to factor analysis, we should be able identify the primary dimensions of smoking outcome expectancies. Such information not only is of theoretical importance (e.g., by identifying common cognitive themes across addictive substances), but also may suggest targets for intervention efforts. In addition, we wanted to include older and more dependent smokers than have previous factor analytic studies of smoking expectancies, which all used early adolescents. It is likely that factors responsible for the initiation of smoking differ from those responsible for its maintenance. In particular, during late adolescence and early adulthood many lighter and occasional smokers appear to shift to either heavier, chronic smoking, or to taper off toward abstention. If those individuals who are at high risk for escalated smoking can be identified they may be targeted for preventive interventions. Smoking expectancies may provide such a means of identification.

The final goal of the study was to compare SEU scores across different categories of smokers. We expected to replicate the alcohol expectancy findings that positive expectancies are related to greater consumption. This would serve as the initial step in validating the questionnaire.

Method

Subjects

Subjects were 1502 introductory psychology students who earned extra credit by completing questionnaires.

Instruments

Smoking Status Form. This questionnaire assessed subjects' current and past smoking status. Based upon their responses, subjects could be classified as daily smokers, occasional smokers, exsmokers, triers (never smoked daily), and never smokers.

Smoking Consequences Questionnaire (SCQ). The developmental version of this questionnaire contained 80 statements describing possible consequences of smoking a cigarette. 16 categories of smoking consequences were included: taste, social facilitation, sensorimotor manipulation, anxiety reduction, dysphoria reduction, anger/irritability reduction, boredom reduction/stimulation, increased positive affect, work facilitation, cravings reduction, positive physical feelings, social impression, respiratory tract irritation, weight control, health risk, and addiction sustainment. Five items represented each of these 16 domains. In order to assess subjective expected utility (SEU), subjects responded to the 80 items twice. They first rated the desirability of each possible consequence of smoking using a -5 to +5 scale. Next they rated on a 0 to 9 scale the likelihood of each consequence

occurring. SEU is the cross-product of the desirability and likelihood scores.

Results

Subject Characteristics

Of the 1502 students who completed the questionnaires, there were 166 daily smokers, 403 occasional smokers, 53 exsmokers, 543 triers, and 337 never smokers. A sample of each category was selected for data analysis. All daily smokers and exsmokers were used, and 186 occasional smokers, 100 triers, and 100 never smokers were randomly selected.

We excluded from analysis 58 SCQs with clearly spurious responses. The 547 remaining subjects included 158 daily smokers, 177 occasional smokers, 47 exsmokers, 85 triers, and 80 never smokers. The daily smokers smoked a mean of 11.2 cigarettes per day, and had smoked for a mean of 2.7 years. Of the occasional smokers, 58 reported smoking every few days, 61 smoked every few weeks, and 58 smoked every few months. The exsmokers had smoked daily for an average of 1.75 years before quitting. Sixty-five percent of the total sample were female, with no significant difference between smoking status groups. The mean age of the sample was 18.7.

Principal Component Analysis

Data from the 382 daily, occasional, and former smokers were entered into a principal components analysis, with squared multiple correlations as the communalities. This resulted in the selection of a five component solution that accounted for 51.6% of the overall response variance. Items with component loadings greater than 0.5 were used to define the components, and were retained for the revised version of the SCQ.

Four of the five components were interpretable. Table 1 lists items from these components, and their loadings. The first component comprised items describing expected negative consequences of smoking. It included 18 items from the original categories of health risk, addiction sustainment, respiratory irritation, and negative social impression. The second component included 15 items from the categories of taste, sensorimotor manipulation, social facilitation, boredom reduction/stimulation, positive affect, craving reduction, and anger/irritability reduction. This component appears to encompass expectations of positive reinforcement from smoking. The third component comprised 12 items from anxiety reduction, anger/irritability reduction, depression reduction, and work facilitation. This component seems to represent expectations of negative reinforcement from smoking. The fourth component included 8 items from 5 different categories. We were unable to interpret this component and excluded it from further analyses and from the revised SCQ. The fifth component comprised all 5 items dealing with appetite and weight control.

The 50 items from the four interpretable components were combined to form the revised SCQ. A separate sample of 100 introductory psychology students completed this questionnaire. The sample comprised 51 daily smokers, 10 occasional smokers, 3 exsmokers, 23 triers, and 13 never smokers. Coefficient alpha reliabilities from this cross-sample were greater than .90 on all four scales, and averaged .94.

Group Differences

Scale scores on the SCQ were calculated by totaling the SEU item scores for each scale, and dividing by the number of items in the scale. Thus, each scale had a possible range of -45 to +45. A MANOVA indicated that the SEU of smoking differed across smoking status groups, Wilkes Lambda $= .86$, approximate $F(16,1644.25) = 5.12$, $p < .001$. Separate ANOVAs were then performed for each of the four retained SCQ scales. Figure 1 displays the group means on each scale. No significant group difference was found on the negative consequences scale. Significant differences were found on both the positive reinforcement scale, $F(4,541) = 17.11$, $p < .0001$, and the negative reinforcement scale, $F(4,541) = 10.19$, $p < .0001$. Planned comparisons using the modified Bonferroni test to control for family-wise error revealed that daily smokers had higher SEUs than each of the other smoking status groups on both reinforcement scales. The ANOVA for the appetite/weight control scale also was significant, $F(4,541) = 2.79$, $p < .05$, with daily smokers scoring significantly higher than both

occasional and never smokers.

Among daily smokers, correlations were calculated between the SCQ scales and smoking rate. Both the positive reinforcement and negative reinforcement scales were significantly, albeit modestly, correlated with smoking rate, $r(N = 155) = .24$, $p < .005$ for both.

Sex Differences

Two-way ANOVAs were calculated with sex of subject and smoking status as the factors. Significant main effects for sex were found on two of the scales. Females had higher SEU scores for appetite/weight control (7.84 vs 1.40; $F(1,536) = 30.46$, $p < .001$), and for negative reinforcement (7.50 vs 5.05; $F(1,536) = 4.77$, $p < .05$). A significant sex by smoking status interaction was also found for negative reinforcement, $F(4,536) = 3.01$, $p < .05$. As seen in Figure 2, only exsmokers showed a significant sex difference on this scale, $t(45) = 3.74$, $p < .001$. Female exsmokers had high SEU scores comparable to daily smokers, whereas male exsmokers produced extremely low (even slightly negative) SEU scores. This difference remained even when years of smoking was covaried out.

Component Scales

Because SEU scores were derived from both desirability and likelihood ratings, the analyses of group differences were repeated on these component scales, to determine their respective contributions to the differences found. Both the desirability and the likelihood scales yielded patterns of smoking group differences similar to the utility scales. However, the likelihood ratings appeared to be more sensitive than either the SEU scores or the desirability ratings to differences in smoking status. For instance, there was a significant group difference on the negative consequences scale, $F(4,541) = 9.10$, $p < .0001$. Daily and occasional smokers rated negative consequences less likely than did exsmokers, triers, or never smokers. In addition, a sex by smoking status interaction was found on the weight control scale, similar to that found on the negative reinforcement scale. Female exsmokers rated appetite/weight control more likely than did male exsmokers.

Discussion

This study identified four components (negative consequences, positive reinforcement, negative reinforcement, and appetite/weight control) that defined the domain of the subjective expected utility of smoking, and that differentiated daily smokers from less frequent smokers and nonsmokers.

Perhaps of the greatest theoretical significance was the extraction of the broad components of positive reinforcement and negative reinforcement. Tomkins (1966) proposed that smokers smoke largely to produce or enhance positive emotional states or to reduce negative ones. Recently, a number of theories have emphasized these two components as the prepotent forces of alcohol and drug motivation (Cox and Klinger, 1988; Baker et al., 1987). Evidence for these two basic drug motivational influences is provided by reports of the situational determinants of alcohol use (e.g., Cannon et al., in press), craving (e.g., Baker et al., 1987; McAuliffe et al., 1986), and relapse (e.g., Brandon et al., in press; Shiffman, 1986) that show that antecedent circumstances can be subsumed by the categories of positive and negative affect. Finally, neurobiological studies suggest that drug craving is governed by distinct neural mechanisms for positive and negative reinforcement (Wise, 1988). In sum, the present results join other converging data indicating that positive and negative reinforcement underlie the maintenance of drug use.

An unexpected, but provocative, finding was the sex difference among exsmokers on the negative reinforcement scale. Exsmoking males reported extremely low SEU scores, whereas exsmoking females reported SEU scores of approximately the same magnitude as daily smokers. We cannot tell from this data whether the drop in the SEU among male smokers preceded or followed smoking cessation. However, we can speculate that possessing such low expectations about cigarettes' ability to relieve negative affect should improve one's long-term prognosis. In contrast, abstinent females appeared to retain the same high utility estimates that they held while smoking. The palliative effects of smoking may remain important to females because they are more likely than males to experience negative emotional states (Weissman & Klerman, 1977). There is also evidence that females

experience more negative affect during nicotine withdrawal than do males (Shiffman, 1979). Females appear more likely to smoke in response to negative affect (Ikard & Tomkins, 1973), and worry more about how they will deal with stress after quitting (Sorensen & Pechacek, 1987). Thus, smoking may play a more important role in coping with negative affect for females than for males. Negative affect smoking has been related to an increased likelihood of relapse (Pomerleau et al., 1978). This would suggest that females should have more trouble quitting smoking than males; some studies have found lower quit rates among females, and other have not.

The final component extracted was appetite/weight control. It appears that smokers think of this as distinct from the other advantageous consequences of smoking, perhaps because the ultimate desired outcome (weight control) is delayed, or because this consequence is less intimately tied to positive affect. Because concern over weight gain may hinder attempts to obtain or maintain abstinence, increased attention is being paid in smoking treatment research to issues of weight control.

Additional research on smoking expectancies using the SCQ may encompass both treatment outcome studies and laboratory research on smoking motivation. We found that exsmokers had significantly lower SEU scores than did daily smokers on both the positive and negative reinforcement scales. Future studies should attempt to identify when and how this shift occurs, and whether it plays a causal role in cessation or maintenance of abstinence. In a similar vein, the hypothetical relationship between smoking expectancies and relapse (Marlatt & George, 1984) can be examined. Brown (1985) found that positive alcohol expectancies measured during treatment predicted later relapse. Longitudinal studies are needed to examine whether an increase in the SEU of drug use precedes relapse. Laboratory studies of drug motivation can investigate even more phasic expectancy shifts. Marlatt (1985) postulates that drug craving is the subjective state associated with positive drug expectancies. It follows then, that conditions that produce cravings for cigarettes (e.g., cue exposure, negative affect) should also produce an increase in the SEU of smoking. One study already found that alcohol cue exposure produced increased expectancies for stimulation/perceived dominance and decreased expectancies for behavioral impairment, and that global positive expectancies were significantly correlated with ratings of desire to drink (Cooney, et al., 1987). The availability of the SCQ will allow similar research with smokers, and permit examination of the specificity of expectancy changes.

A number of caveats must be observed regarding this research. First, the component analysis should be cross-validated on another sample of smokers. We need to examine whether the same four-component solution is derived when older, heavier smokers are used. The second caveat is that the precise role that expectancies play in smoking motivation is unknown. Although there is some evidence that expectancies are causally related to drug use, it remains possible that they are merely epiphenomena. Finally, we do not know the relation between expectations and other constructs (e.g., social desirability, response sets, etc.). Future research must address these issues.

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Table 1

Factors extracted from the Smoking Consequences Questionnaire

Item	Factor Loading
Factor 1: Negative Consequences	
The more I smoke, the more I risk my health.	.867
Smoking is hazardous to my health.	.863
By smoking I risk heart disease and lung cancer.	.851
The longer I smoke, the harder it will be to quit.	.851
Smoking is taking years off my life.	.834
I will probably die earlier if I continue to smoke.	.817
Each cigarette I smoke maintains my addiction.	.791
I will become more dependent on nicotine if I continue smoking.	.777
Smoking makes me seem less attractive.	.715
My mouth tastes bad after smoking.	.703
Smoking will make me cough.	.700
People think less of me if they see me smoking.	.697
Smoking irritates my mouth and throat.	.676
I look ridiculous while smoking.	.650
Cigarettes make my lungs hurt.	.632
Cigarettes control me more and more the longer I smoke.	.612
I become more addicted the more I smoke.	.550
My throat burns after smoking.	.510
Factor 2: Positive Reinforcement	
I enjoy the taste sensations while smoking.	.760
When I smoke, the taste is pleasant.	.737
I will enjoy the flavor of a cigarette.	.710
Cigarettes are good for dealing with boredom.	.663
Cigarettes taste good.	.641
If I have nothing to do, a smoke can help kill time.	.596
I enjoy feeling a cigarette on my tongue and lips.	.589
I really enjoy a cigarette when I'm relaxed and feeling good.	.560
I like to watch the smoke from my cigarette.	.543
I enjoy feeling the smoke hit my mouth and the back of my throat.	.542
Cigarettes give me something to do with my hands.	.537
If I'm feeling irritable, a smoke will help me relax.	.537
I feel more at ease with other people if I have a cigarette.	.535
I enjoy parties more when I am smoking.	.516
Smoking temporarily reduces those repeated urges for cigarettes.	.514
Factor 3: Negative Reinforcement	
When I'm angry a cigarette can calm me down.	.810
Cigarettes help me deal with anger.	.758
Cigarettes help me deal with anxiety or worry.	.753
Smoking reduces my anger.	.744
Smoking calms me down when I feel nervous.	.742
If I'm tense, a cigarette helps me to relax.	.731
Smoking helps me deal with depression.	.644
Cigarettes help me reduce or handle tension.	.643
Cigarettes help me concentrate.	.614
When I'm upset with someone, a cigarette helps me cope.	.552
If I'm disappointed in myself, a good smoke can help.	.540
When I am sad, smoking makes me feel better.	.523
Factor 4: Appetite/Weight Control	
Smoking helps me control my weight.	.817
Smoking keeps my weight down.	.807
Cigarettes keep me from eating more than I should.	.773
Smoking controls my appetite.	.658
Cigarettes keep me from overeating.	.650

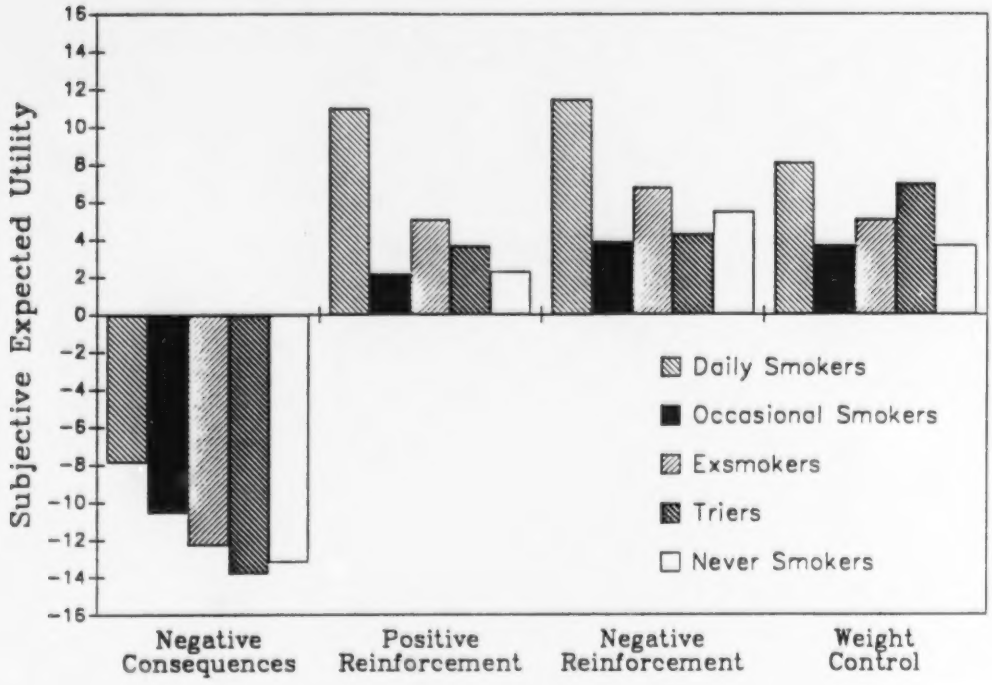

Figure 1: Mean subjective expected utility scores on each of the four scales of the Smoking Consequences Questionnaire, by smoking status group.

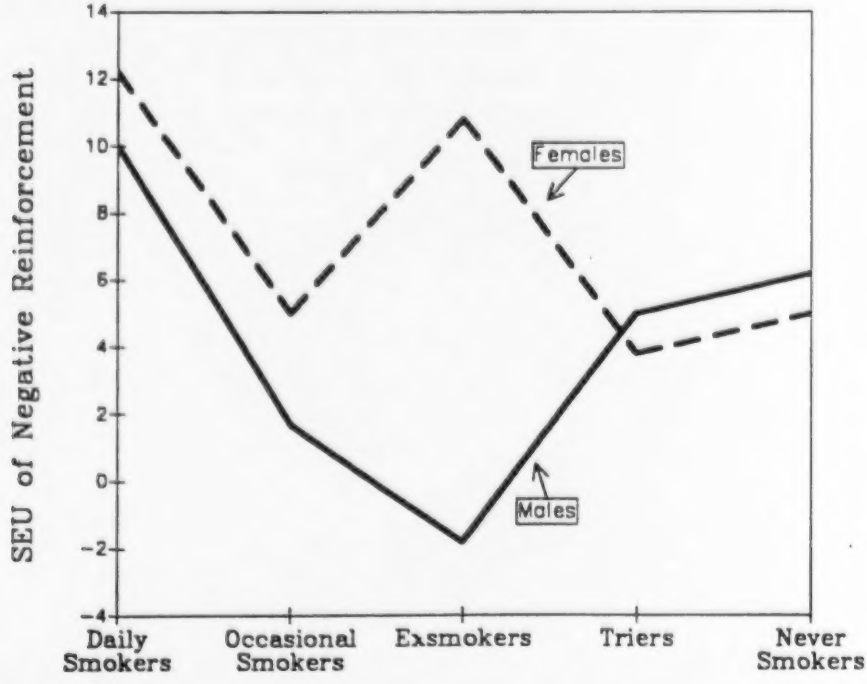

Figure 2: Mean subjective expected utility scores for males and females on the negative reinforcement scale, by smoking status group.